

# PATENT ABSTRACTS OF JAPAN

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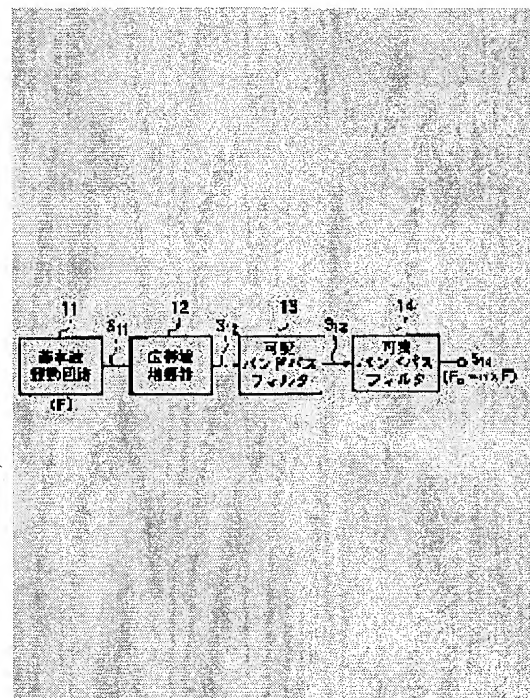
## (54) OSCILLATOR

### (57)Abstract:

**PURPOSE:** To provide a highly versatile oscillator capable of using the higher harmonic of not only an odd order but also an even order and using a higher harmonic of a still higher order.

**CONSTITUTION:** This oscillator is provided with a fundamental wave generation circuit 11 for generating fundamental waves including higher harmonic which is (n)-fold of a fundamental frequency F, a wide band amplifier 12 for amplifying the entire output signals S11 of the fundamental wave generation circuit 11 to the frequency of plural orders, a variable band pass filter 13 for extracting only a prescribed frequency from the output signal S12 of the wide band amplifier 12 and outputting it as a signal S13 and the variable band pass filter 14 set to a passing band similar to the variable band pass filter 13 for outputting the

inputted signal S13 as the signal S14 of the frequency (n)×F. Thus, the oscillator with high versatility capable of using the higher harmonic of not only the odd orders but also the even orders such as second order, third order, forth order, fifth order and sixth order, etc., arbitrarily selecting a desired frequency, and using a higher harmonic of still higher order without being limited to the fifth order is realized.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] The oscillator which has the filter which extracts and outputs only the frequency of the predetermined band containing the frequency of a higher harmonic from the output signal of the fundamental-wave generation circuit which generates a fundamental wave including two or more higher harmonic, the amplifier which is made to amplify the output signal of a fundamental-wave generation circuit to two or more frequency, and outputs it, and the above-mentioned amplifier.

[Claim 2] The oscillator according to claim 1 by which two or more filters with which passbands differ in the output of the above-mentioned amplifier, respectively are connected to juxtaposition.

[Claim 3] For the level of a fundamental wave, the above-mentioned amplifier is an oscillator according to claim 1 or 2 constituted by the amplifier which has the high pass property of remaining as it is and making the level of a high order higher harmonic wave amplifying.

[Claim 4] The oscillator according to claim 1, 2, or 3 with which at least one cascade connection of the filter concerned and the filter which has the passage property of abbreviation identitas is carried out to the latter part of the above-mentioned filter.

[Claim 5] The above-mentioned filter is an oscillator according to claim 1, 2, 3, or 4 constituted in the passband with the adjustable filter which can be set as arbitration.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the oscillator which used two or more higher harmonic.

[0002]

[Description of the Prior Art] Drawing 8 is the block diagram showing the basic configuration of this kind of conventional oscillator. This oscillator is constituted by the oscillator circuit 1 and the tuning circuit 2. Generally a quartz resonator is used for an oscillator circuit 1. The quartz resonator has many 3rd odd times as many frequency components [ 5th / 7th / oddth ] as the frequency of the fundamental wave. and this oscillator -- the output signal of an oscillator circuit 1 -- a tuning circuit 2 --  $3f_0$ ,  $5f_0$ , and  $7f_0$  etc. -- a frequency is resonated and it outputs. In addition, it is  $f_0$  here. Resonance frequency is expressed.

[0003]

[Problem(s) to be Solved by the Invention] However, in the conventional oscillator mentioned above, generally, since the eventh level is extremely low as compared with the oddth order, the eventh frequency component has the problem that it cannot be used. Moreover, even if level becomes low and the number of high order higher harmonic waves is odd, the 5th order is a limit from not making it usually amplify.

[0004] It is in offering the high oscillator of the versatility which this invention can be made in view of this situation, and the purpose can use not only the oddth order but the eventh higher harmonic, and also can use a high order higher harmonic.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the oscillator of this invention has the filter which extracts and outputs only the frequency of the predetermined band containing the frequency of a higher harmonic from the output signal of the fundamental-wave generation circuit which generates a fundamental wave including two or more higher harmonic, the amplifier which is made to amplify the output signal of a fundamental-wave generation circuit to two or more frequency, and outputs it, and the above-mentioned amplifier.

[0006] Moreover, in the oscillator of this invention, two or more filters with which passbands differ in the output of amplifier, respectively are connected to juxtaposition. Moreover, as for the above-mentioned amplifier, the level of a fundamental wave remains as it is, and it is constituted by the amplifier which has the high pass property of making the level of a high order higher harmonic wave amplifying.

[0007] Moreover, in the oscillator of this invention, at least one cascade connection of the filter concerned and the filter which has the passage property of abbreviation identitas is carried out to the latter part of the above-mentioned filter. Moreover, the above-mentioned filter is constituted in a passband by the adjustable filter which can be set as arbitration.

[0008]

[Function] According to the oscillator of this invention, the fundamental wave of a frequency  $F$  is generated in a fundamental-wave generation circuit, and it is outputted to amplifier. The higher harmonic of secondary -- [ 3rd / 4th / 5th / 6th / 7th ] which is  $nF$  it is  $n$  times whose frequency of this centering on the fundamental wave of a frequency  $F$  is included in the output signal of a fundamental-wave generation circuit. In amplifier, although the magnification operation over an input signal is performed, at this time, only a specific frequency is not amplified, but the whole is amplified to two or more frequency, and it is outputted to a filter. With the filter, the passband is set to the fundamental wave  $n$  times the frequency of choice of  $F$ , for example. Therefore, only the signal of the setting frequency  $nF$  is extracted and outputted from an input signal.

[0009] Moreover, if cascade connection of the filter which has the same passage property further in the latter part of a filter is carried out, spurious level will be outputted by the steep wave suppressed low.

[0010] Moreover, the output of the frequency of arbitration is obtained by \*\* which connects to the output side of amplifier two or more filters with which passage properties differ, or an adjustable filter connects in one circuit.

[0011]

[Example] Drawing 1 is the block diagram showing the 1st example of the oscillator concerning this invention. In drawing 1, in 11, a fundamental-wave generation circuit and 12 show 13, and the wideband amplifier and 14 show the adjustable band pass filter, respectively.

[0012] The fundamental-wave generation circuit 11 is equipped with the oscillator circuit which used a quartz resonator, a ceramic vibrator, dielectric vibrator, etc., and outputs the fundamental wave of a frequency  $F$ . The frequency centering on the fundamental wave of a frequency  $F$  includes the higher harmonic of  $n$  times (however,  $n=2, 3, \dots$ ) as many  $nF$  as this in the output signal  $S11$  of this fundamental-wave generation circuit 11. Specifically, the frequency contains the odd harmonic of 3rd-- [ 5th / 7th ] of secondary -- [ 4th / 6th ] which is even times the fundamental wave whose frequencies are odd times the fundamental wave with even harmonics.

[0013] As shown in drawing 2, the wideband amplifier 12 amplifies the output signal  $S11$  of the fundamental-wave generation circuit 11 with big gain as it becomes a high order harmonic. Only a specific frequency cannot be amplified but the whole can be made to amplify to two or more frequency by amplifying with big gain from the amplitude being small as it becomes a high order harmonic as it becomes a high order harmonic in this way.

[0014] It is the circuit diagram showing the concrete example of a configuration of the wideband amplifier 12 in drawing 3. As shown in drawing 3, this wideband amplifier 12 is a npn transistor  $Q1$ , bias resistance  $RA$ ,  $RB$ , collector resistance  $RC$ , the inductance component  $LC$ , and emitter resistance  $RE$ . And bypass capacitor  $CE$  It is constituted.

[0015] Specifically, they are bias resistance  $RA$  and  $RB$  between the supply line of supply voltage  $VCC$ , and touch-down. It connects with a serial and these connection middle points are connected to the input edge  $TIN$  of a signal  $S11$ , and the base of a transistor  $Q1$ . It is collector resistance  $RC$  between the supply line of supply voltage  $VCC$ , and the collector of a transistor  $Q1$ . And inductance component  $LC$  It connects with a serial and is the inductance component  $LC$ . The connection middle point with the collector of a transistor  $Q1$  is the outgoing end  $TOUT$  of a signal  $S12$ . It connects. Moreover, it is emitter resistance  $RE$  between the emitter of a transistor  $Q1$ , and touch-down. And bypass capacitor  $CE$  It connects with juxtaposition.

[0016] It amplifies with big gain, and the amplifier which has such a configuration changes into a signal level the current which was amplified and appeared in the collector, and outputs it as a signal  $S12$  as it becomes the high order harmonic of small-size width of face about the signal current by \*\* which supplies the output signal  $S11$  of the fundamental-wave generation circuit 11 inputted into the input edge  $TIN$  to the base of a transistor  $Q1$ .

[0017] The adjustable band pass filter 13 passes only a predetermined frequency band from the output signal  $S12$  of the wideband amplifier 12, and is outputted to the adjustable band pass filter 14 as a signal  $S13$ . The passband of this adjustable band pass filter 13 can be changed into arbitration, and the frequency band ( $n$  times of the frequency of a fundamental wave =  $nF$ ) of a high order ( $n$ -th order)

harmonic is selected by arbitration.

[0018] Drawing 4 (a) and (b) are the circuit diagrams showing the example of a configuration of an adjustable band pass filter. As shown in drawing 4, an adjustable band pass filter is a capacitor C1 - C4. And inductance component L1 It is constituted. And as shown in drawing 4 (a), it is a capacitor C3. By applying a capacity adjustable capacitor, a passband can be set as arbitration. moreover, it is shown in drawing 4 (b) -- as -- capacitor C3 The capacity adjustable not a thing but inductance component L1 \*\*\*\*\* -- even if it applies an inductance adjustable thing, the adjustable band pass filter which can set a passband as arbitration can be constituted similarly.

[0019] The adjustable band pass filter 14 has the same configuration as the adjustable band pass filter 13, and arbitration constitutes the passband possible [ modification ]. Generally, it is set as the same passband as the adjustable band pass filter 13. This adjustable band pass filter 14 outputs the signal S14 of a frequency  $F_0$  ( $nF$ ). Thus, since cascade connection of the band pass filters 13 and 14 is carried out, the so-called spurious level is stopped low and an output signal S14 serves as a steep wave.

• [0020] Next, actuation by the above-mentioned configuration is explained. The fundamental wave of a frequency  $F$  is generated in the oscillator circuit of the fundamental-wave generation circuit 11, and it is outputted to the wideband amplifier 12 as a signal S11. The higher harmonic of secondary -- [ 3rd / 4th / 5th / 6th / 7th ] whose frequency centering on the fundamental wave of a frequency  $F$  is  $n$  times (however,  $n = 2, 3, \dots$ ) as many  $nF$  as this is included in the output signal S11 of this fundamental-wave generation circuit 11.

[0021] In the wideband amplifier 12, the magnification operation over an input signal S12 is performed. At this time, it is amplified with big gain as it becomes a high order harmonic. That is, only a frequency [ \*\*\*\* ] is not amplified but the whole is amplified to two or more frequency. The signal which received the magnification operation is outputted to the adjustable band pass filter 13 as a signal S13.

[0022] As for the adjustable band pass filter 13, the passband is set to the fundamental wave  $n$  times the frequency of choice of  $F$ . Therefore, only the signal of the setting frequency  $nF$  is extracted from an input signal S13, and it is outputted to the adjustable band pass filter 14. The passband of the adjustable band pass filter 14 is set as the same passband of the adjustable band pass filter 13, and the signal S14 of frequency  $nF$  is outputted from the adjustable band pass filter 14. Since this output signal S14 passed the band pass filters 13 and 14 of plurality (this example two) by which cascade connection was carried out, it is outputted by the steep wave by which spurious level was stopped low.

[0023] The fundamental-wave generation circuit 11 which generates a fundamental wave including a  $n$  times as much higher harmonic as fundamental frequency  $F$  according to this example as explained above, The wideband amplifier 12 which makes the whole amplify the output signal S11 of the fundamental-wave generation circuit 11 to two or more frequency, The adjustable band pass filter 13 which extracts only a predetermined frequency from the output signal S12 of the wideband amplifier 12, and is outputted as a signal S13, Since the adjustable band pass filter 14 which is set as the same passband as the adjustable band pass filter 13, and outputs the inputted signal S13 as a signal S14 of frequency  $nF$  was formed It includes to two or more order. The secondary  $n$  times as much order [ 3rd / 4th / 5th ] as the frequency  $F$  of a fundamental wave, The high oscillator of the versatility which can use a still higher order higher harmonic can be realized without being able to use not only the 6th order [ 7th / oddth ] but the eventh higher harmonic, and being able to choose the frequency of choice as arbitration, and being restricted to the 5th about order. Moreover, since two or more band pass filters 13 and 14 by which cascade connection was carried out are passed and an output signal S14 is acquired, spurious level can acquire the steep wave suppressed low, and can realize an oscillator with the high engine performance.

[0024] In addition, even if the level of a fundamental wave remains the wideband amplifier 12 as it is and the amplifier which has the high pass (highpass) property of making the level of a high order higher harmonic wave amplifying constitutes, the effectiveness mentioned above and the same effectiveness can be acquired.

• [0025] Drawing 5 is the block diagram showing the 2nd example of the oscillator concerning this invention. This example shows the case where high order vibrator is used for the oscillator-circuit

section of fundamental-wave generation circuit 11a. According to this example, it is output signal S14a of a still higher frequency ( $n \times nxF$ ). It can obtain.

[0026] Drawing 6 is the block diagram showing the 3rd example of the oscillator concerning this invention. A different point from the 1st example which this example mentioned above has a passband in having connected to juxtaposition the band pass filters 15, 16, and 17 which are  $2F$ ,  $3F$ , and  $4F$ , respectively instead of carrying out cascade connection of the adjustable band pass filters 13 and 14 to the output side of the wideband amplifier 12.

[0027] According to this example, if two or more frequency outputs in the oscillator circuit (fundamental-wave generation circuit) of 1 are obtained, it can \*\*. In addition, also in this example, the steep wave by which spurious level was stopped low can be acquired by carrying out cascade connection of the band pass filter which has the same passage property in the latter part of each band pass filters 15, 16, and 17.

[0028] Drawing 7 is the block diagram showing the 4th example of the oscillator concerning this invention. A different point from the 3rd example which this example mentioned above connects the output of the wideband amplifier 12 to the input of each band pass filters 15, 16, and 17 through a circuit changing switch 18, changes a circuit changing switch 18 to arbitration based on the output signal S19 of the change control circuit 19, and is to have constituted so that only the signal of a desired frequency might be outputted. Other configurations are the same as that of the 3rd example mentioned above, and the operation effectiveness of them acquired is the same as the 3rd example.

[0029]

[Effect of the Invention] As explained above, according to this invention, the high oscillator of the versatility which can use a still higher order higher harmonic can be realized, without being able to include to two or more order, being able to use not only the secondary  $n$  times as much order [  $3rd / 4th / 5th / 6th / 7th / oddth$  ] as the frequency of a fundamental wave but the eventh higher harmonic, and being able to choose the frequency of choice as arbitration, and being restricted to the 5th about order. Moreover, by passing two or more band pass filters by which cascade connection was carried out, and acquiring an output signal, spurious level can acquire the steep wave suppressed low, and can realize an oscillator with the high engine performance.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the 1st example of the oscillator concerning this invention.

[Drawing 2] It is drawing showing the magnification property of the wideband amplifier concerning this invention.

[Drawing 3] It is the circuit diagram showing the concrete example of a configuration of the wideband amplifier concerning this invention.

[Drawing 4] It is the circuit diagram showing the example of a configuration of the adjustable band pass filter concerning this invention.

[Drawing 5] It is the block diagram showing the 2nd example of the oscillator concerning this invention.

[Drawing 6] It is the block diagram showing the 3rd example of the oscillator concerning this invention.

[Drawing 7] It is the block diagram showing the 4th example of the oscillator concerning this invention.

[Drawing 8] It is the block diagram showing the basic configuration of the conventional oscillator.

[Description of Notations]

11 -- Fundamental-wave generation circuit

12 -- Wideband amplifier

13 14 -- Adjustable band pass filter

13a, 14a, 15, 16, 17 -- Band pass filter

18 -- Circuit changing switch

19 -- Change control circuit

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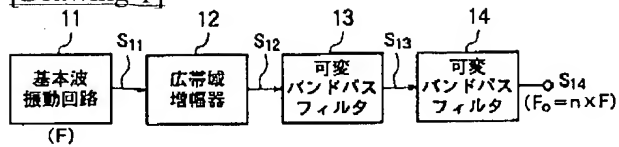
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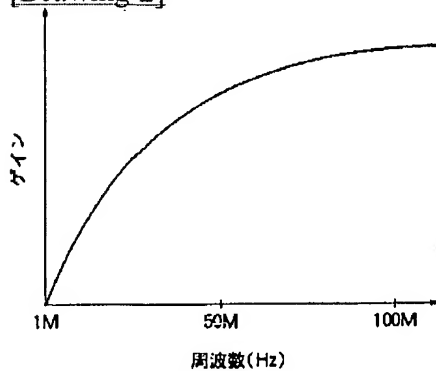
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## DRAWINGS

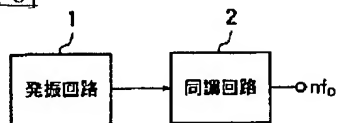
[Drawing 1]



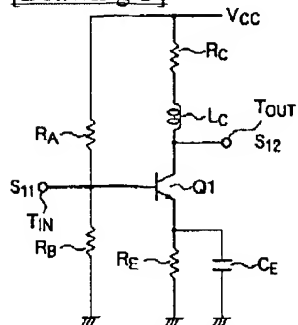
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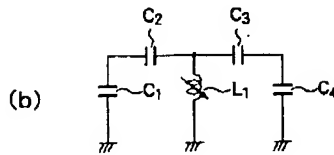
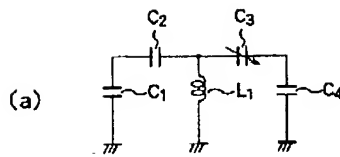
[Drawing 8]



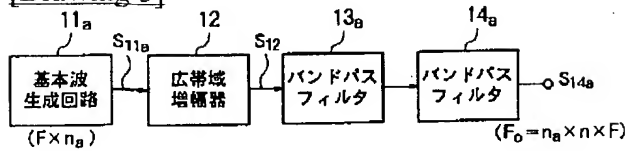
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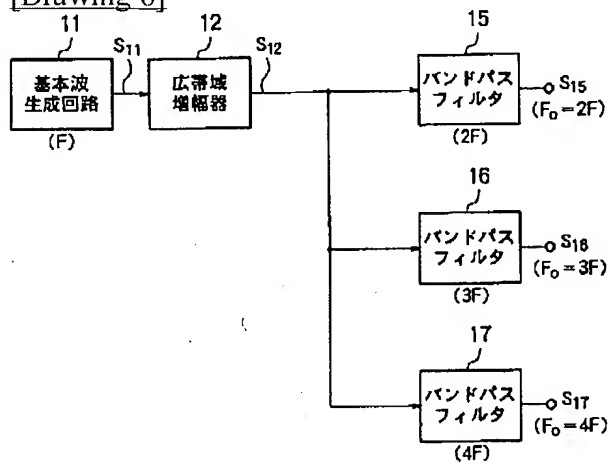
[Drawing 4]



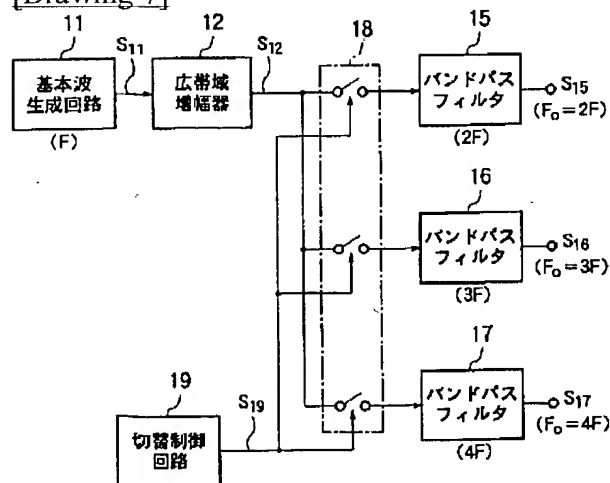
[Drawing 5]



[Drawing 6]



[Drawing 7]



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